

# SCENEX LIGHTING®

## PP4 Pixel Driver

### Instructions Manual

(Draft version 1.0)



## Safety Instructions



The **PP4** is a High-Tech Product. To guarantee a smooth operation, it is necessary to respect the following rules.

The manufacturer of this device will not take responsibility for damages through any disregard of the information provided in this manual. Warranty claims also will be voided in the case that the fixture housing is opened.

1. Before powering on the fixture, make sure that the PP4 fans and air inlets are clean and not blocked.
2. **The PP4 doesn't contain any user serviceable parts. Opening the fixture will void all warranties.**

## **Product Features**

- Simplified wiring; each output supplies data and power to pixels over a single cable
- Control of multiple pixel strings simultaneously
- Any output can drive any number of pixels over multiple universes up to the full capacity of the driver
- Control of up to 2,040 individual pixels using Unicast E1.31 or Art-Net, and 1,190 pixels using Multicast E1.31
- Universe assignment up to 12 Universes
- Ethernet connection eliminates need for hardware “dongles” and special data wiring
- Power and Ethernet present indicators
- Multiple pixel types supported
- All configuration and status reporting is done using the built-in web server
- Temporary IP address override for built in web server access
- Advanced configuration options included RGB color order, string length, pixel grouping, pixel type, reversed and zig-zag strings, ‘null’ pixels, DMX addressing range, universe spanning, gamma correction, and more
- Neutrik Powercon input and thru
- Simultaneous support of up to 4 different LED pixel types
- Data and power outputs are individually fused
- Built-in test patterns

## **Scenex Lighting PP4 LED Driver Specifications**

- 4 output ports utilize data and power via standard 4 pin XLR connectors
- Supported pixels include : LPD6803 , LPD880X, WS2801, WS2811, TLS3001, 1903, 9813
- Power input: 100 – 240VAC, 50/60 Hz
- Power output: 5V DC / 40 Amp output
- 2 additional power injection ports
- Durable steel casing
- IP22 rating
- 1 ½ U Rack Mount ( ½ U required for cooling)
- Dimensions: 1.75 in x 17.25 in x 8.25 in / 45 mm x 440 mm x 210 mm
- Weight: 8 lbs. / 3.7 kg
- 2 x 10mm threaded mounting points for clamp attachment for truss
- Forced air cooling
- Operating temperature: 32-104°F / 0-40°C

## XLR PIN OUT for PP4 Driver

XLR Pin #	Function
1	Ground
2	Clock
3	Data
4	5 Volts DC

## XLR Pin Out for PP4 Driver to Scenex Lighting Pixel Tape

XLR Pin #	Tape Wire	Function	Tape Type
1	Yellow	Ground	WS2801/WS2811
2	Blue	Clock	WS2801 only
3	Green	Data	WS2801/WS2811
4	Red	5 Volts DC	WS2801/WS2811

## Accessing the PP4 Web Server

This discussion assumes that the PP4 controller is connected via a LAN cable to your LAN, typically to an unused port on your router.

All configuration of the PP4 controllers is done via a web configuration page. The web page is displayed by typing the IP address of the controller into a web browser's address bar. In order to access the web page the current controller IP address must be known, and it must lie within the address range of the LAN to which the controller is connected.

The initial access to the web page presents a bit of a chicken-or-the-egg dilemma. In order to set the controller's IP address we need to be able to access the web page, but we may not be able to access the web page if the existing IP address isn't known, or isn't valid for our network.

All controllers ship with a default IP address of 192.168.1.206. Almost all small networks will use some variant of 192.168.x.y IP addresses. Of those, the 192.168.1.x range is the most common. Since the 192.168.1.x addressing scheme is common, it's usually easiest to first try accessing the controller at its default IP address of 192.168.1.206.

To do that, open your web browser and type 192.168.1.206 into the command bar (where you typically see the http:// addresses), and press ENTER. If you see the controller's web page displayed, then you can skip ahead to the next section, where you see an image of the web page.

If you're here, the 192.168.1.206 address didn't work. The most likely cause is that your network uses an address range other than 192.168.1.x. You can determine that with this simple procedure. Note that this is a one-time procedure. Once you've overridden the default IP address with one that's compatible with your network, we'll change the PP4s IP address to be one that's valid for your network to make future access to the web page simple.

The following procedure is good for Windows 7; other versions of Windows will use a similar procedure. In the text that follows, bold and capital letters are used to identify what you need to type or which screen button to 'click', you need not use caps when actually entering the commands:

Press the **WINDOWS** button to open the start menu.

Type **CMD** in the search bar and press **ENTER**.

A black window should open. In the black window type **IPCONFIG /ALL** then press **ENTER**. (That's IPCONFIG then a space, then a forward slash followed by the word ALL.)

Scroll up if necessary using the scroll bar to display the first part of the text that has appeared in the window. Look for an area called "**Ethernet Adapter Local Area Connection**". Within that area look for the line "**IPv4 Address**". Generally the number displayed will be:

192.168.x.y, where x will usually be 0 or 1, (sometimes higher) and y can be any number. **The third digit, X in the example, is what you need to know.** If X is 0, your LAN uses 192.168.0.X addressing. Other common IP ranges would be 2.X.X.X or 10.X.X.X. (The 169.254.X.X address range will be used if your PC is not connected to a router or is connected to a wireless router.)

Now that you know the address range used by your LAN, you can override the factory default IP address of the PP4 and force it to have an IP address that's within the range of your LAN. This is done by using the **Temp IP Override** button on the PP4.

Using the information about your LAN's address range, pick the override you need to use from this table **Over-Ride Code**

	<b><u>Purpose</u></b>
1	Display current IP address on LEDs, continue until restarted
2	Force a temporary IP address of 2.2.2.2
3	Force a temporary IP address of 10.10.10.10
4	Force a temporary IP address of 169.254.74.73
5	Force a temporary IP address of 192.168.0.206
6	Force a temporary IP address of 192.168.1.206.....

Note: Codes from 5 to 15 all force a temporary IP address of 192.168.X.206, where X is the over-ride code – 5. For example, over-ride code 15 forces a temporary IP address of 192.168.10.206, because 15-5=10.

As an example, if you determine that your LAN uses 192.168.0.x addressing, then you would use override 5 to force an IP address of 192.168.0.206 because that is within the address range used by your LAN. If your IP address is of the form 2.X.X.X or 10.X.X.X or 169.254.X.X you would use over-ride codes 2, 3, and 4 respectively.

Overrides are done by use of the **Temp IP Override** button on the PP4. Use this procedure:

Determine the override code you need to use per the discussion above, it will be in the range of 2 to 15.

Once the controller is powered up and the LEDs are lit, press AND HOLD the **Temp IP Override** button.

After about 2 seconds you will see the RED and GREEN LEDs flash on and off together at the rate of one flash per second. Count the flashes and release the PROGRAM button when the lights flash on for the number of times equal to your override code. With our previous example, a LAN using 192.168.0.X addressing, we determine from the table that we need override 5. So we would hold down PROGRAM until the LEDs come on for the 5<sup>th</sup> time, then release it.

After you release the **Temp IP Override** button the LEDs will come on and stay on. Now you should be able to enter the override address into your browser's address bar and you should see the controller's web page.

If you are unable to use the above procedure successfully, there is an alternate method to access the controller page. Unplug your computer's LAN cable from your router and wire it directly to the Ethernet jack on the controller. **Reboot the computer** and then use over-ride code 4 on the controller. You should then be able to access the controller's page at 169.254.74.73.

**Note: The IP address created by the over-ride is temporary.** Once you are able to access the controller's web page, change the IP address to an address that is within the range of your LAN, save by clicking **Update System Information**, then restart the controller.

There is an additional use of the override; that is to display the current IP address of the controller. This is useful if, for whatever reason, do not know the IP address that the controller is set to. You can use override #1 to display the IP address on the LEDs.

### **Over-ride code 1, IP address display**

Use over-ride code 1 to determine the IP address of the controller when it is not known. Press and hold the **Temp IP Override** button until the red and green LEDs come on together for the first time, then release (over-ride code 1). The LEDs will now display the current IP address. For each digit, the green LED will come on, then the red LED will flash a number of times corresponding to the value of that digit. Then the green LED will go off. This process repeats until all 12 digits of the IP address have been displayed, and the entire process repeats continuously until the controller is restarted by pressing the PROG button again, or by pressing the RESET button (all but PP4), or by interrupting power to the controller. For the factory default IP address of 192.168.1.206, you would see the following pattern on the LEDs:

Brief pause with both LEDs off, then green ON, then red flashes 1 time, then green off (1)  
Brief pause with both LEDs off, then green on, then red flashes 9 times, then green off (9)  
Brief pause with both LEDs off, then green on, then red flashes 2 times, then green off (2)  
(slightly longer pause, then next group begins)

Once the current IP address is known (factory default is 192.168.1.206), if it is within the address range of your LAN just enter that IP address in your browser's address bar. If it is outside of the range of your LAN use the override procedure described above.

Once you have successfully accessed the PP4's web page, you will see a screen similar to the following:

# SanDevices SACN/E1.31/Art-Net RGB Pixel Controller Model E6804

## System Information:

IP Address	Subnet Mask	MAC Address	Up-Time	Receive Mode	Timeout	Test Pattern	Gamma Value	
192 168 1 206	255 255 255 0	4A:49:4D:B0:B9:ED	0000:00:16	<input checked="" type="radio"/> Multicast E1.31 <input type="radio"/> Unicast E1.31 <input type="radio"/> Art-Net	0	0	1.0	<a href="#">Update System Information</a>
Firmware Version: 4.026	Firmware update status: None Tried							<a href="#">Update Firmware</a>

## Universe Selection and Packet Statistics:

Universe	Multicast, Unicast or Art-Net Universes							Unicast or Art-Net Only Universes					<a href="#">Update Universe Numbers</a>
	1	2	3	4	5	6	7	8	9	10	11	12	
Packets Received	428	428	427	0	0	0	0	0	0	0	0	0	0
Sequence Errors	5	5	5	0	0	0	0	0	0	0	0	0	0
Invalid Packets	0	0	0	0	0	0	0	0	0	0	0	0	0

## Output Configuration:

Outputs	Outputs In Use	Output Type	Length Pixels	Group Size	Color Order	Start Address		End Address		Reverse	Zigzag Every	Null Pixels	Refresh Rate	
						Universe	Channel	Universe	Channel					
1	<input checked="" type="checkbox"/>	WS2801	50	1	RGB	1	1	1	150	<input type="checkbox"/>	0	0	212	<a href="#">Update</a>
2	<input checked="" type="checkbox"/>	GE CirEff	50	1	RGB	1	151	1	300	<input type="checkbox"/>	0	0	20	<a href="#">Update</a>
3	<input checked="" type="checkbox"/>	1804/2811	50	1	RGB	1	301	1	450	<input type="checkbox"/>	0	0	245	<a href="#">Update</a>
4	<input checked="" type="checkbox"/>	TLS3001	50	1	RGB	1	451	2	90	<input type="checkbox"/>	0	0	81	<a href="#">Update</a>

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In general, you will make configuration changes by entering the desired value(s) using entry boxes, checkboxes, buttons, and drop-down lists. Then you will click the corresponding **UPDATE** button for the changes to take effect. Please note that there are several **UPDATE** buttons; **when you make changes in one area of the screen, you must press the proper UPDATE button, before moving on to make changes in another area.** In particular, each pixel output has its own configuration line and its own **UPDATE** button. So when configuring outputs, you would make all changes to output 1, then click that line's **UPDATE** button. Then move on to output #2 and repeat the procedure.

The web page is divided into 3 main sections: **System Information**, **Universe Selection**, and **Output Configuration**.

## System Information

The **System Information** section allows the user to view and/or change the following system settings:

**IP Address:** This is the IP address that the controller will have **when it is not over-ridden at startup**. This IP address is used to access this web page, and is also used as the destination address if using E1.31 Unicast mode or Art-Net (described later). The IP address is entered as 4 separate numeric values. The controllers are shipped with a default address of 192.168.1.206. If your LAN uses 192.168.1.x addressing, you should be able to access the controller simply by entering that IP address into the URL bar of your browser. If your LAN uses a different address range, there is an override mechanism, described earlier in this manual that allows you to use the **PROGRAM** button on the controller to force a different IP address at startup. Typically this is used to force an IP address in the range of your LAN, then you can access the web page, and change the IP address so that is within the address range of your LAN. To change the IP address simply click on all of the 4 IP address boxes and enter the desired values. When finished you must click the **Update System Information** button to save your changes. In order for the new IP address to take effect, you must then

restart the controller, by pressing the **RESTART CONTROLLER** button at the lower left. Note that **ONLY an IP address change requires a restart**, all other changes take effect immediately when the corresponding **UPDATE** button is pressed.

***If you used the override procedure to access the controller***, you should change the IP address now to one that is compatible with your network so that you can access the controller in the future without using the override. You will see a line at the top of the screen that shows the temporary IP address that is in use because of the override:

### **System Information:**

Temporary IP Address is: 192.168. 1.206

*In many cases this will be a good choice for the permanent IP address. You would want to use a different address if your LAN already has another device at this address, such as another pixel controller. In general, just use the next consecutive address. Enter*

*the 4 parts of the desired IP address in to the 4 **IP Address** boxes. Verify that all parts of the IP address have been entered correctly. Once they are all correct, click on the **Update System Information** button. Wait a few seconds then click the **Restart Controller** button. Wait a few more seconds until both LEDs come back on, then you should be able to type the new IP address into your browser to regain access to the controller's web page.*

The controller's **Subnet Mask** is shown next. This is set automatically by the controller based on the IP address in use.

The controller **MAC Address** and controller **Up-Time** items are display only items, and cannot be changed. **Up-Time** simply shows the elapsed time since the controller was last restarted.

**Receive Mode** Receive Mode is an item that can be changed by clicking on the appropriate button to change the receive mode from Unicast E1.31 to Multicast E1.31 or Art-Net. At this time Art-Net support is limited to reception of ArtDMX packets directed on the controller's IP address. ArtPollReplies are not supported. In general, it is suggested to use Multicast E1.31 as your first choice. The other modes are more specialized, and will be described later.

**Timeout** may be set to any value in the range of 0-99. If non-zero, and if incoming data stops, all of the controller outputs will be turned off after the selected number of seconds of delay. If set to 0 this feature is disabled.

**Test** A test pattern may be enabled by setting a value greater than 0. A value of 0 disables test patterns, a non-zero value enables a test pattern. **When test patterns are enabled the controller will not display any received data. When test patterns are enabled the web page will take longer to render, so it is suggested to keep test pattern turned off while working with the web page.**

Test Patterns: 1-3 All pixels lit RED, GREEN, or BLUE respectively  
4-6 A bright pixel chases from start to end leaving dim pixels behind, RED, GREEN, and BLUE  
7-10 35%, 50%, 75%, and 100% white all pixels. USE WITH CAUTION: 100% WHITE ON ALL PIXELS CREATES MAXIMUM LOAD ON THE PIXEL POWER SUPPLY.  
11 Pixel pairs alternate between VIOLET and GREEN.  
12-29 A pattern of n RED pixels followed by n GREEN pixels followed by n BLUE pixels followed by n OFF pixels, that chases through the entire range of pixels, where n is the test pattern number – 10. **For example, test pattern 15 is a group of 5 pixels of each color (15-10=5).**

(Please note that the colors you observe may be different than those listed, this simply means that your pixels don't use the standard R->G->B color order. Not to worry, this can be fixed later.)

**Gamma Value** may be set to any value in the range of 1.0 (no correction) to 3.0 (maximum correction) in increments of 0.2. Gamma correction is used to improve the dimming characteristics of some pixel types to make them have a more



natural-looking dimming characteristic, more gradual at the low end similar to the dimming characteristics of incandescent bulbs.

Gamma Correction works with all 12-bit pixel types such as TLS3001 and CYT3005, and works with 8-bit pixels if the string length is 55 pixels or less.

After making any changes to any items in the **System Information** area, you must click the **Update System Information** button for the changes to take effect. **With the exception of a change to the IP address, all changes become effective immediately and do not require a restart of the controller.**

## Universe Selection and Packet Statistics

This area is where you define the list of universes that the controller will respond to. The set of universes needed will depend on how your pixels or other devices are defined in the software package that sends out the E1.31 packets. This could be LOR, LightShowPro, Madrix, etc. **Later in this manual there will be a discussion that explains many of these terms, and talks about the design of a pixel system. If you're new to pixels, you can skip over the information here that you're not familiar with, and then after reading the material later in the manual you will have a better understanding of how these configuration settings work.**

Based on the settings that you use to address your pixels in your sequencing software, you will know how many universes, and which universes, need to be received by this controller. Typically the universe numbers are entered in order from lowest to highest. Unused universes may be left at 0. Valid universe numbers are 1-63998. There should be no duplications in the universe numbers used, in other words **don't enter any universe number in more than one box.** Universe numbers are entered simply by clicking on the appropriate entry box and entering the desired value. When finished, click the **Update Universe Numbers** button to save the changes. Universe number changes become effective immediately. **Note that the selections here simply determine which set of incoming universes the controller will receive. In the next section we will assign those universes to control specific pixel strings.**

This section of the page contains 3 additional items of information for each universe: **Packets Received, Sequence Errors, and Invalid Packets.** These are display-only items. Packets Received lists the total number of packets received for this universe since the controller was restarted. **Sequence Errors** shows the number of packets that were missed, or skipped over. Typically this value will be rather small, but not necessarily 0. For example, the controller will tend to miss some incoming packets when the web page is being updated, although this is typically not visible because the packets come in so quickly. **Invalid Packets** indicates the count of packets that were not proper E1.31/SACN packets. This should rarely have a non-zero value.

**Important: The first 7 universes can be used for pixel control data of any type: Multicast E1.31, Unicast E1.31, or Art-Net. The last 5 universes cannot be used for Multicast E1.31. If you use Multicast E1.31 you must only assign the 1<sup>st</sup> seven universes to your pixel strings (see Output Configuration, below).**

## Output Configuration

This is where the individual controller outputs are configured. Outputs are labeled 1 through 4, matching the numbers on the PP4 itself. Each output has its own **Update** button which must be clicked for the changes to be saved and to take effect. Changes take effect immediately when the Update button is clicked, no controller restart is needed.

Remember that changes will not take effect until the appropriate Update button is clicked, and will not be saved if a different Update button is clicked. So, when configuring outputs, configure all of the items for one output then click that Update button to save those changes. Then move on to the next output and repeat the procedure.

**Outputs In Use** This box is checked if the corresponding output is in use. Outputs that are marked as in use will be assigned a range of DMX addresses if the specified Length in Pixels is greater than 0. This box should be checked for each pixel output that will be used.

Outputs	Outputs In Use	Output Type
1	<input checked="" type="checkbox"/>	WS2801
2	<input checked="" type="checkbox"/>	LPD6803
3	<input checked="" type="checkbox"/>	WS2801
4	<input checked="" type="checkbox"/>	GE ClrEff
		1804/2811
		16716
		LPD880x
		981x
		TLS3001
0		DMX
		RENARD57k

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**Output Type** is a drop-down selection list that allows you to choose the type of pixel (or other device) attached to this output. As of this time the following pixel types are supported: 6803, 2801, GE Color Effects, 1804/2811, 16716, 880x, 981x and 3001. Non-pixel output types supported are Renard (57.6kpbs) and DMX.

**Length in Pixels** is where you enter the number of pixels that make up the pixel string or strip connected to this output. For output types **Renard** or **DMX**, the value entered here would be the number of channels of output desired divided by 3, since each 'pixel' uses three channels. As an example, for a full universe of DMX output, (actually 510 channels), you would specify a length of 170. This is because 170 pixels would use 510 channels.

**Group Size** allows pixels to be controlled in groups rather than individually. This feature would typically be used either to reduce the number of channels needed or to simplify programming of the pixels. When the group size is other than 1, instead of pixels being controlled individually, groups of pixels are controlled. For example, with a string length of 50 pixels and a group size of 5, the string would be controlled as 10 groups of 5 pixels and would use only 30 channels (10x3) instead of 150 channels (50x3).

**Color Order** is a drop-down that allows the specific color order of the pixels connected to this output to be specified. This can be helpful if the particular pixel string or strip does not use the standard R->G->B color order. If the pixels do not light with the expected colors because they use a color order other than RGB, changing the color order to the proper sequence (often by trial and error), will correct the problem.

Group Size	Color Order	Start Address	
		Universe	Channel
<input type="text" value="1"/>	<input type="text" value="RGB"/>	<input type="text" value="5"/>	<input type="text" value="1"/>
<input type="text" value="1"/>	<input type="text" value="RGB"/>	<input type="text" value="6"/>	<input type="text" value="91"/>
<input type="text" value="1"/>	<input type="text" value="RGB"/>	<input type="text" value="8"/>	<input type="text" value="1"/>
<input type="text" value="1"/>	<input type="text" value="RGB"/>	<input type="text" value="9"/>	<input type="text" value="1"/>

**Start Address** Each output that is marked as in use, and has a length greater than 0, is assigned a sequential block of DMX addresses. The length of this address block is (Length in Pixels) X 3, because each pixel requires 3 channels, one for each of its primary colors; red, green, and blue. Note that if pixel grouping is used the number of channels needed will be reduced accordingly.

The operator can configure the starting address for each output. All pixels on that output are then assigned consecutive addresses beginning with the specified start address. The necessary channels may span across one or more universe boundaries, depending on the start address and the number of channels needed. When the

end of a universe is reached (channel 510 is the last channel used in each universe), channels will be assigned from the next selected universe based on the order of universe selection (see Universe Selection and packet Statistics).

In most cases the selected universes will be assigned sequentially. For the first controller the starting universe will often be Universe 1. If using Multicast for example, the first controller would typically be configured for universes 1 through 7.

If a different group of universes is selected, this will affect how channel addresses are assigned. For example, assume that the first 5 selected universes (from left to right) are 1, 3, 5, 7, and 9. If we define output output 1 as having 200 pixels, then this output needs 600 total channels. Assume that we start this output at Universe 1 Channel 1. Since there are only 510 useable channels per universe, the last 90 channels will be assigned from Universe 3, since Universe 3 follows Universe 1 in the universe selection list.

The selection of the start address for an output is done by entering the starting Universe (from a drop down list which will only show the list of available universes), and a starting channel, a numeric entry from 1 through 508.

Although not specifically required, it's best to start every output on a channel number of 1 or 1 plus a multiple of 3 (4, 7, 10...508). The example below reflects the selected universe group consisting of universes 5 through 16.

Color Order	Start Address		End Address	
	Universe	Channel	Universe	Channel
<input type="text" value="RGB"/>	<input type="text" value="5"/>	<input type="text" value="1"/>	6	90
<input type="text" value="RGB"/>	<input type="text" value="6"/>	<input type="text" value="91"/>	7	180
<input type="text" value="RGB"/>	<input type="text" value="8"/>	<input type="text" value="1"/>	8	150
<input type="text" value="RGB"/>	<input type="text" value="9"/>	<input type="text" value="1"/>	9	510
	<input type="text" value="10"/>			
	<input type="text" value="11"/>			
	<input type="text" value="12"/>			
	<input type="text" value="13"/>			
	<input type="text" value="14"/>			
	<input type="text" value="15"/>			
	<input type="text" value="16"/>			

You can see in this example, that a starting address of Universe 5 Channel 1 produced an ending address of Universe 6 (the next universe in line) channel 90. This is because the output needs 600 total channels, 510 from Universe 5 and 90 from Universe 6. The ending channel is calculated automatically by the controller, only the starting address can be entered.

**Note: Start Address and End Address values are NOT displayed for any output that is not enabled, or has a length of 0.**

Reverse	Zigzag Every	Null Pixels	Refresh Rate	
<input type="checkbox"/>	<input type="text" value="0"/>	<input type="text" value="0"/>	212	<input type="button" value="Update"/>
<input type="checkbox"/>	<input type="text" value="0"/>	<input type="text" value="0"/>	20	<input type="button" value="Update"/>
<input type="checkbox"/>	<input type="text" value="0"/>	<input type="text" value="0"/>	245	<input type="button" value="Update"/>
<input type="checkbox"/>	<input type="text" value="0"/>	<input type="text" value="0"/>	81	<input type="button" value="Update"/>

**Reverse** The Reverse check-boxes allow you to indicate that the associated string is ‘backwards’, in other words the first pixel to light will actually be the last pixel of the string. An example where this feature would be useful is a roofline, where the controller is mounted at the mid-point, with one pixel string (say #1) running to the left and another (say #2) to the right. Without the reverse feature, if you began lighting pixels in order, you would actually be lighting pixels

beginning at the center of the roof, working left to the left end, then jumping back to the center and then working to the right. By selecting the check-box to indicate that the first string is reversed the pixel sequence will be as it should be, from left to right with no jumps.

**Zigzag** The Zigzag feature is another feature that can simplify the pixel programming by allowing the pixel addresses to flow in a more logical order. As an example, say you have a matrix of 200 pixels arranged in 20 columns of 10 pixels. If you start at the bottom left you would string pixels 1-10 from bottom to top in the first column, and then pixels 11-20 from top to bottom in the 2<sup>nd</sup> column, and so on, basically zig-zagging up and down. When done, if you lit pixels in order from the lowest address to the highest, you would see a pattern that started at the lower left and zig-zagged up and down across the matrix. When programming the pixels, it’s often easier if the pixels light in a more natural order. In this example, we would use the zigzag feature to tell the controller that the pixels reverse direction every 10 pixels. Now, lighting sequential pixels produces the desired effect, the first column lights from bottom to top, then the 2<sup>nd</sup> column from bottom to top, etc.

**Null Pixels** Null pixels are pixels which are ignored by the controller and never lit. The most common use of null pixels is to allow a longer length of wiring between the controller and the start of a pixel string. Because the pixel control signals aren’t designed to travel over long distances, it may not be possible to use wire runs longer than about 20 feet. If the particular installation requires a longer wire run than normal, this can often be accomplished by inserting one or more extra pixels in the wire run between the controller and the pixel string. Each of these pixels will regenerate the control signals, enabling them to be run for another 20 feet or so. As an example, if we needed to have a 100 foot wire run between the controller and a pixel string, we might use 4 null pixels, one at 20 feet, 40 feet, 60 feet, and 80 feet. Even though the total run was 100 feet the maximum distance between pixels is only 20 feet because of the null pixels.

Another use for null pixels is when you don’t need the full length of your string. Say you have a 50-pixel string but only need 48 pixels lit. If it’s more convenient to have the unused pixels at the start of the string rather than at the end, set the string length to 48 at set null pixels to 2.

**Refresh Rate** This is a displayed value that shows the approximate refresh rate of the pixels connected to this output. It is affected by pixel type and string length.

### **Special Purpose Buttons**

There are 3 special buttons at the bottom of the page, and one number entry box.

**Refresh Page** simply refreshes the page without changing any configuration. Since the web page never updates by itself, you would use the **Refresh Page** button, for example, to see updated packet statistics, or updated system up-time.

**Restart Controller** simply does a reset of the controller, the same as would happen if you removed then reapplied power. It would most commonly be used after a change of the IP address, since an IP address change does not become effective until the controller restarts.

The **System Command** button is used to perform some infrequently used functions, based on a numeric value that is entered into the number box to its left. There are 3 system commands presently defined:

- 10 Erase system configuration memory. This will wipe out all configuration data with the exception of the IP address.
- 20 Set test default configuration. This function sets all outputs for type 2801 pixels, 50 pixels per string.
- 30 Set as-shipped defaults. This sets 4 different pixel types on the 4 outputs.

As an example, to return a board to the factory default configuration (other than IP address) you would enter 10 in the system command box and **click System Command**. Then enter 20 and click **System Command**. Then enter 30 and click **System Command**.